

UNIVERSITY OF BAHRAIN
COLLEGE OF INFORMATION TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE

ITCS 322 – Operating Systems

Midterm Examination
Second Semester, 2013-2014

Date: 24-APRIL-2014

Time Allowed: 90 Minutes

Name	[REDACTED]
Student I.D.	[REDACTED]
Section	[1] [2] ✓ <i>Please tick one</i> [3]

Question 1	10	9
Question 2	14	14
Question 3	06	5.5
Question 4	10	10
Question 5	15	12.5
TOTAL	55	51

Notes:

- Please make sure that you write your FULL NAME, ID and Section number before you start the paper.
- Write your answers in the space provided for the purpose.
- You must switch off your mobile before starting the examination.

Question 1

[10 Marks]

Answer the following.

What is difference between preemptive and non-preemptive scheduling?

[3 Marks]

In the non-preemptive scheduling when a process running it will continue until it terminated or blocks itself and it can't be interrupted.

In the preemptive scheduling the running process can be interrupted and suspend by other process.

What is the common feature in FCFS and SJF CPU scheduling algorithms?

[1 Mark]

Both of them are nonpreemptive algorithms.

What are TWO major disadvantages/drawbacks of shortest job first algorithm?

[2 Marks]

starvation problem, the big process have to wait for long time
we must know the burst time for each process and this is very difficult

Consider the following scenario. A process arrives in the ready queue and waits there for 10 ms before it gets the CPU. It executes for 5 ms and is moved to wait/block state. It waits in the HDD queue for 7 ms and then reads data from the disk that takes 5 ms of time. After completing the I/O operation, the process moves to ready state again and waits in the ready queue for 5 ms before it gets the CPU. The process executes for 4 ms and then terminates. What is the turnaround time of the process? Show your calculations.

[3 Marks]

Turnaround time = CPU Time + waiting time + I/O time + I/O waiting

$$= (5+4) + (10+5) + 5 + 7$$

$$= 9 + 15 + 5 + 7 = 36$$

Give ONE example of an I/O bound process.

[1 Mark]

read file from disk

Question 2

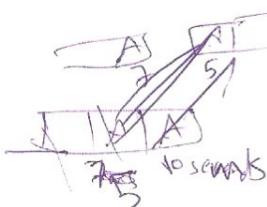
[14 Marks]

Write any TWO events that may abort (i.e. abnormal termination) a process.

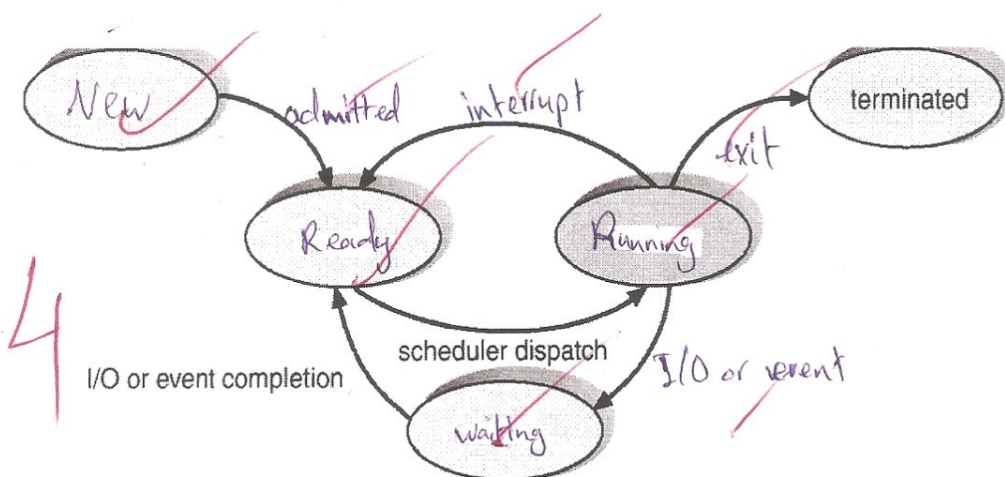
[2 Marks]

Memory unavailable: process need memory more than the available memory.

illegal instruction: process try to execute ~~priviled~~ privileged instruction



Complete the following process state diagram by writing states and events. [4 Marks]



What is a process control block (PCB)? What information is generally stored in a PCB? [3 Marks]

3 PCB is a structure that hold the information of the process and ~~it~~ it is created when a process created and linked to the process table for each process. It stores: the process identifier (PID) and the user that responsible for it (UID), the process that create this process (PPID) and the status register for the process and ~~the~~ ^{PID} program counter and the memory limits for the process.

What is difference between independent and cooperative processes? [2 Marks]

2 independent process: can't affect or ^{be} affected by other processes.

cooperative process: can affect or be affected by other processes.

An operating system maintains a number of (scheduling) queues. What are names of these queues? Which processes will be added in each queue? [3 Marks]

Job queue: It holds the new created ~~processes~~ ^{processes which} they are not in the memory.
Ready queue: It holds the processes which they are ready and waiting to execute next.

2 ~~Device queue~~ Device queue: It holds the processes which they are waiting to do I/O operation.

(every device has own queue like, printer queue, ~~hard~~ hard disk queue etc)

Question 3

[6 Marks]

Complete the following table by putting a ✓ under the OS component which is responsible for each of the functions (given in the first column). [4 Marks]

Function	Memory Manager	Protection System	Process Manager	File Manager	Secondary Storage Manager	I/O System Manager
Disk scheduling					✓	✓
Allocating and deallocating memory space as needed	✓					
Providing mechanisms for deadlock handling			✓			
Backup files onto stable (non-volatile) storage media				✓	✓	
Suspending a process			✓			
Memory management of I/O	✓					
Distinguish between authorized and unauthorized usage.		✓				
Providing mechanisms for process synchronization			✓			

What do we mean by System Calls? Write ONE Linux System Call.

[2 Marks]

System calls are functions used to request a service from the operating system, like `fork()`.

Question 4

[10 Marks]

How does a CPU know whether a device is idle (doing nothing) or not?

[2 Marks]

by checking the status register for the device, the status register has two bits to determine that, the done bit and the busy bit if the busy bit is 0 and the done bit is 0 then the device is idle.

What are the methods for dealing with multiple interrupts? Explain.

[4 Marks]

1- disable interrupts while executing an interrupt (execute the interrupts sequentially) when an interrupt is executing if interrupts come they will pending until the interrupt finished.
2- assign priorities to interrupts a higher priority interrupt cause a lower priority interrupt to wait and back to ready queue.

Explain how memory can be protected? Explain with an example. Which instructions should be privileged instructions to protect memory? [4 Marks]

by adding two registers to determine the ^{range of the} legal memory address the process may access. they are the base register which it holds the smallest physical address the process can access and the other register is the limit register which it contains the size of the range.

For example if process A has base register = 1000

and limit = 500. if a process

want access a memory OS must check if the memory greater than or equal 1000 and less than $1000 + 500$ then allow the process to access the memory else terminate the process

- the load base and load limit instructions should be privileged

Question 5

[15 Marks]

What methods can be used to discover a resource/service on a peer-to-peer system? [3 Marks]

- 2.5
- broadcast a request for a service and response
 - a service to request via discovery protocol,
 - lookup table, register the node registers its service in central table.

What are differences between hard real-time and soft real-time systems? [4 Marks]

3

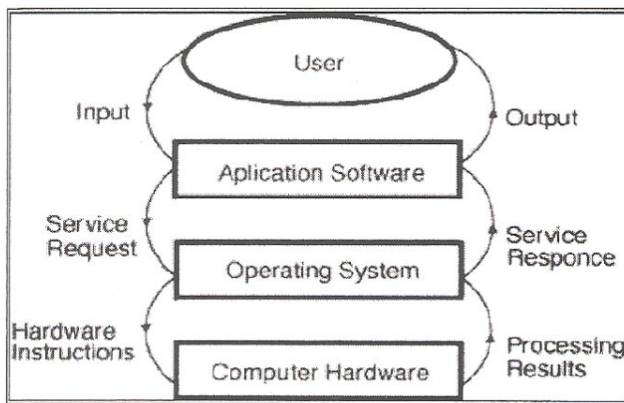
In hard real-time system the programs must meet their deadlines, use as device controller in industrials and robotics.

In soft real-time system the programs try to meeting their deadlines but that not important like in hard real-time systems use full for multimedia programs.

What features are required in time-sharing interactive systems but not in multi-programmed batch systems? [3 Mark]

provide online-file system for the users to access the data
provide Job synchronization
provide communication facilities

Explain the following diagram. [5 Marks]



This diagram shows how the user interact with the computer hardware and as shown the user can't directly access the computer hardware and instead of that there are some steps to input information to computer hardware or output other information, for example if the user want to input ~~the~~ data he will write the data in the application software and then the application software will request a service from the operating system by system calls or whatever else, then the operating system will move the data to the hardware and the same thing for the output and since the operating system is the resource manager it is the only ~~that~~ responsible for input data to resources or output data from resources